Volume 40 August, 1954 *Number 8*

Lubrication

A Technical Publication Devoted to the Selection and Use of Lubricants

THIS ISSUE

Lubrication of
Modern
Printing Machinery

PUBLISHED BY
THE TEXAS COMPANY
TEXACO PETROLEUM PRODUCTS

EACH PIN represents one of the more than 2,000 Texaco Distributing Plants located throughout all 48 States.

HOW TEXACO HELPS YOU

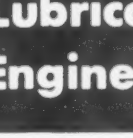
GET INCREASED PRODUCTION and lower unit costs . . . those are the benefits industry enjoys with the help of superior Texaco Lubricants and skilled Texaco Lubrication Engineering Service. Here are just a few examples (names on request):

"For twenty years," says a potash producer, "Texaco has given us dependable diesel performance . . . minimum maintenance expense and very low fuel consumption."

"For over ten years," reports a metal working company, "Texaco has helped us turn out more at lower unit cost."

"Five years ago," states an appliance manufacturer, "we put an initial fill of Texaco into the hydraulic system of a 500-ton press. In spite of severe service . . . the press has never been down for repairs."

Let Texaco help you. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TEXACO

TEXACO Lubricants, Fuels and Lubrication Engineering Service

LUBRICATION

A TECHNICAL PUBLICATION DEVOTED TO THE SELECTION AND USE OF LUBRICANTS

Published by
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Vol. XL August, 1954 No. 8

Change of Address: In reporting change of address kindly give both old and new addresses.

Lubrication of Modern Printing Machinery

WHEN John Gutenberg printed the first bible nearly five centuries ago, the crude mechanisms of the wine press which he had adapted for the purpose required no lubrication. In fact, even if lubricants had been available the rough nature of most of the wooden parts would not have warranted their application. The process involved hand operation of the press; speed was unheard of; time was of but little importance; artistry in reproduction was apparently the major objective. Priceless library volumes testify to the attention which the printer of years gone by gave to his work.

It was not until early in the nineteenth century that any really radical changes were made in press design or pressroom procedure. Until then the printing of only some 200 impressions per hour had been practicable. When the first successful cylinder press was put into operation an output of around 1,000 copies per hour was made possible. The rotary web press followed a few years later. From then on speed became the primary objective of the press designer. Today the modern newspress turns out papers at a rate well above 100,000 copies an hour, folded, ready to read, and the ink doesn't smudge.

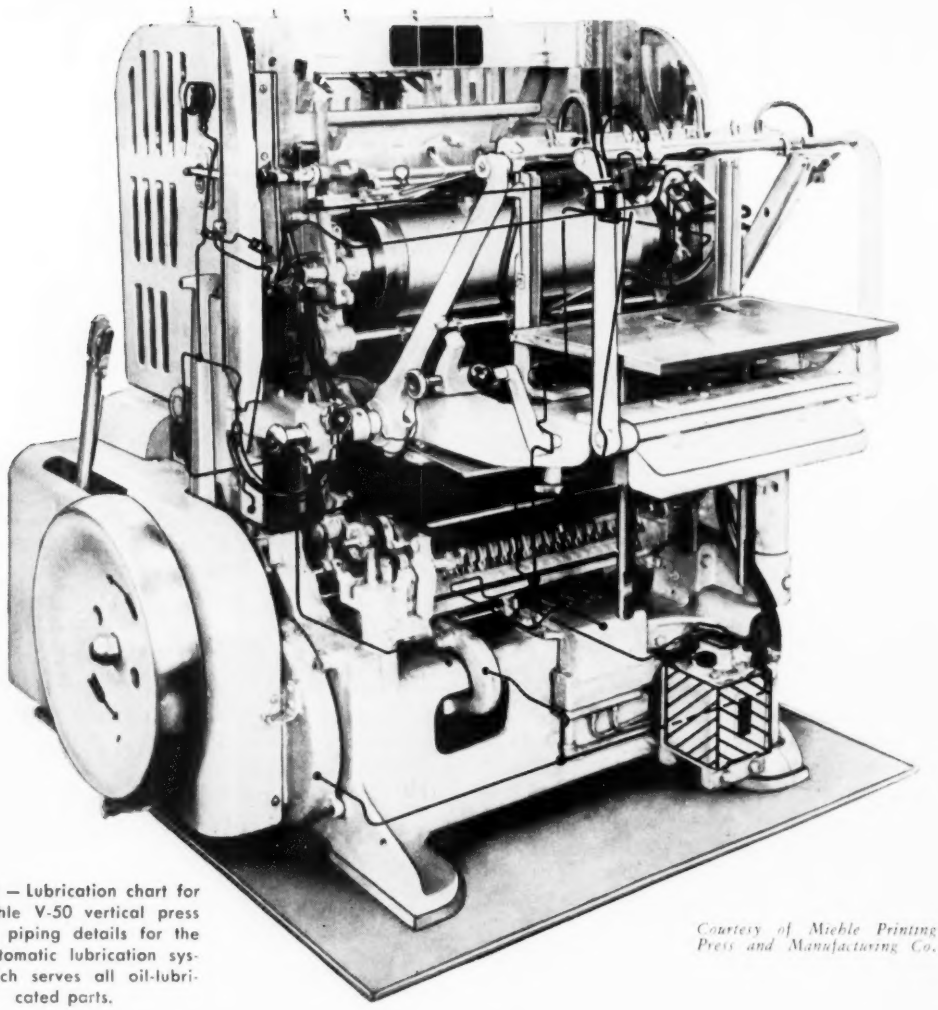
The petroleum industry has played an important part in this perfection of the modern printing press. Petroleum oils are used in preparing the special quick-drying inks; petroleum lubricants protect the multitude of fast moving, precision-built bearings, gears, slides and cams which enable the machine parts to function in perfect unison.

METHODS OF LUBRICATION ALSO HAVE BEEN MODERNIZED

The changes which have taken place in methods of lubrication have been almost as revolutionary as the changes which have been made in press design over the past few years. Hand oiling has largely given way to the centralized system, and open mechanisms are housed wherever practicable to enable circulating or bath lubrication with less chance of oil throw. In addition to protecting the machine parts, these improved methods of press lubrication have contributed to pressroom safety and marked reduction in the accident rate. Floors are kept free from dripped, spilled or thrown oil or grease.

TYPES OF LUBRICATION ADAPTABLE

Before discussing the various parts of the flat-bed, platen or rotary press it is well to have an overall knowledge of the features and basic details of the various lubricating systems which have been found to be suited to pressroom service. Automatic operation of any such system is highly desirable. Machine output is assured and the operating parts are free to function with the least amount of friction when lubricated with just enough oil or grease to maintain the required



Courtesy of Miehle Printing Press and Manufacturing Co.

Figure 1 — Lubrication chart for the Miehle V-50 vertical press showing piping details for the Bijur automatic lubrication system which serves all oil-lubricated parts.

lubricating films. Too little can lead to starved lubrication and wear, too much may induce internal friction, increase the power consumption and possibly involve a hazard to operators if leakage occurs.

Since both oil and grease are required for press lubrication, systems of lubrication have been perfected to handle both these basic types of lubricants. Where oil is used the centralized oiling system, mechanical force feed lubricator or wick feed oiler may be installed by the press builder according to the importance of the part and its location. The extent to which a number of parts on a location such as a feed board or delivery area are enclosed will influence choice of the lubrication system. Where parts are more or less inaccessible, as for example beneath the press, it is well to plan for measured or force feed lubrication either with oil or grease, control of flow being maintained from a safe location at the side of the press.

Pressure grease lubrication is favored by most builders for bearings which are sufficiently well housed to permit them to retain a charge of grease without undue leakage. Frequency of re-lubrication is thereby reduced. This hold true particularly for ball or roller bearings which usually are equipped with grease-retaining seals.

Centralized Pressure Oil Lubrication

The modern press is well suited to application of a centralized pressure oiling system. In this type of system automatic lubrication is maintained through a central control, which assures that all the parts being served are flushed and supplied automatically with oil from a central tank or reservoir.

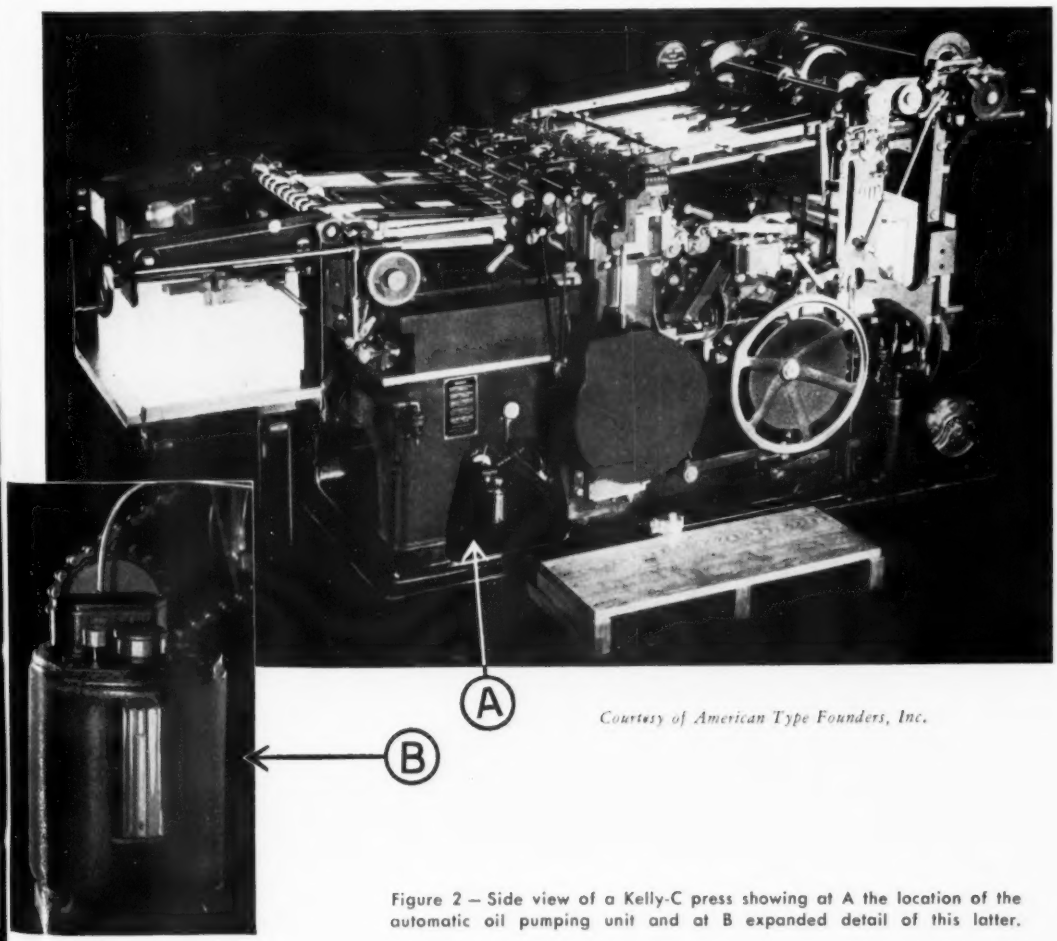
This latter usually is attached to the side of the

press, within ready reach of the operator. It is equipped with a suitable plunger which operates the pump. Lubrication of all parts connected thereto becomes but a matter of turning a hand wheel, pulling a plunger or pressing a button. The frequency with which this should be carried out will depend upon the speed of the press, the size of the bearings and the length of time the press is operated. In centralized pressure lubrication, the amount of oil fed is restricted to as nearly as possible the theoretical lubricating requirements of the respective bearings. As a result, it may readily be classified as a "fresh oil" system with the possibility of providing means for oil recovery and reclamation.

The fact that certain bearings will vary from others in regard to their oil requirements necessitates the provision of some arrangement of regulation or control of oil flow. In effect this amounts to metering the oil in terms of drops. It can be brought about either by proper individual construction of the drip plugs, which on such equipment are also known as control outlets; by use of a control device located at the base of the pump; or by the installation of suitable adjusting manifolds at salient points in the system.

Where any such system is properly installed it becomes relatively fool-proof, exceedingly simple to operate, and an insurance that clean oil will be delivered to the respective bearings. It is essential, however, that all parts be of rigid construction and capable of withstanding jars, shocks, and temperature fluctuations, for while piping, etc., is guarded wherever possible, it is relatively impossible to absolutely protect all parts from the chance of contact with external materials.

It is interesting to note that the possibility of entry of dust into such a system is quite as negligible as in a pressure grease lubricator. To further insure that clean oil is used, however, certain central oil reservoirs are equipped with suitable filtering media, such as a felt pad, which is claimed to effectively remove any foreign matter that may have entered the oil in the course of stor-



Courtesy of American Type Founders, Inc.

Figure 2 — Side view of a Kelly-C press showing at A the location of the automatic oil pumping unit and at B expanded detail of this latter.

age or handling prior to usage. Lubricating oils as received from, or delivered by, reputable oil refiners can be relied upon as being free from non-lubricating foreign matter and capable of giving maximum protection.

The Mechanical Force Feed Lubricator

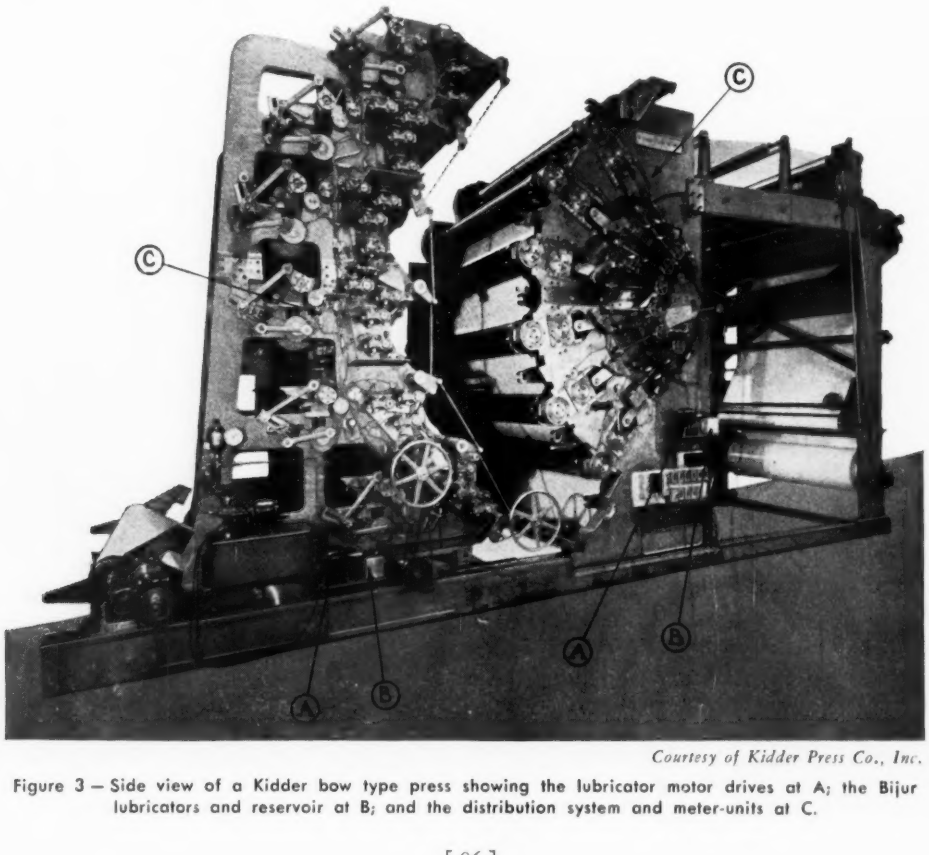
The mechanical force feed oiler involves one-time lubrication in very much the same manner as an oil cup or drip feed oiler. However, it delivers a more nearly requisite amount of oil under a certain amount of pressure to meet the bearing requirements. When the oil feed is properly adjusted, such a lubricator is dependable and a decidedly economical device.

While there may be limitations as to the number of parts which can be served by one lubricator, there is the distinct advantage that it can be readily driven through a connection such as link mechanism from the press itself. As a result a mechanical force feed lubricator functions only when the press is in operation and then at a proportional speed. In other words, the higher the speed of operation the more oil will be delivered. The pumping capacity and rate of oil flow therefore is variable. Furthermore, such a lubricator will automatically start or stop with the machine. When once adjusted it becomes a most dependable means of lubrication.

There is more or less of a limitation, however, to the use of a mechanical force feed oiler, in that the reservoir capacity is oftentimes comparatively small commensurate with the machine requirements. As a result, such a device must be refilled with oil at frequent intervals, depending on the speed of operation, the number of oil feeds and the rate of oil delivery. This latter must be worked out in actual practice according to parts to be lubricated, the viscosity of the oil and methods of sealing.

Design Features

The typical mechanical force feed oiler consists of a bowl or reservoir of varying capacity ranging normally from one pint to two gallons. The pump usually is located within this reservoir being operated by a link or ratchet mechanism. The type of pump depends upon the type of lubricator. In general, it will involve a piston or plunger. According to the service involved, quite a number of such pumping units can be included in the one lubricator. Furthermore, this latter can be divided



Courtesy of Kidder Press Co., Inc.

Figure 3 — Side view of a Kidder bow type press showing the lubricator motor drives at A; the Bijur lubricators and reservoir at B; and the distribution system and meter-units at C.

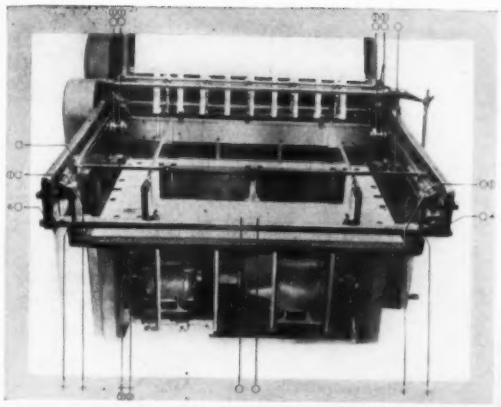
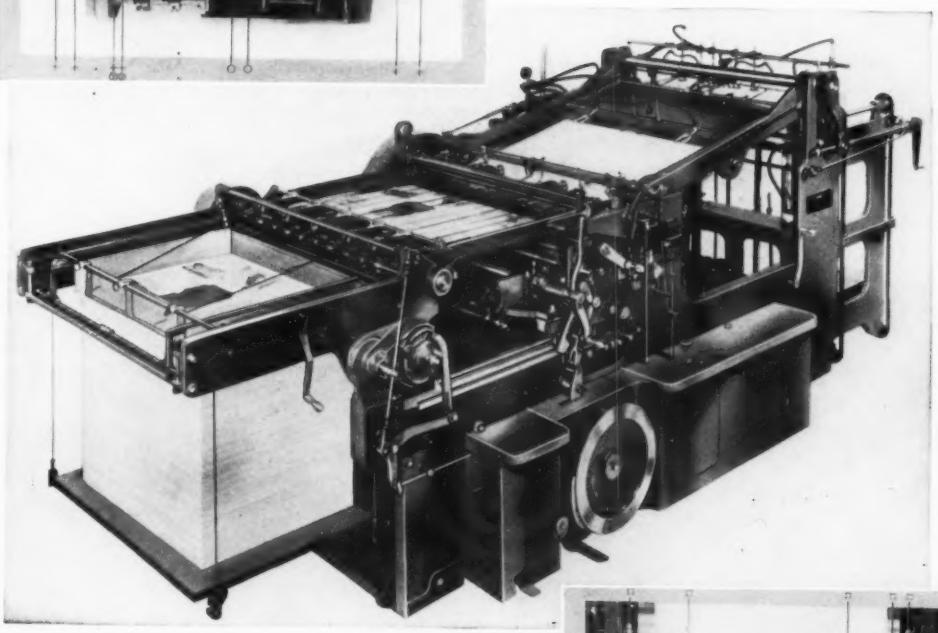


Figure 4 — The Miller single color letterpress has provisions for both automatic and hand lubrication. The automatic system consists of an oil reservoir; automatic cut-out switch; oil pump and of course the necessary distributing piping and fittings. Typical lubrication charts are shown for the delivery end and bed motion mechanisms. See builder's instruction manual for interpretation of symbols.

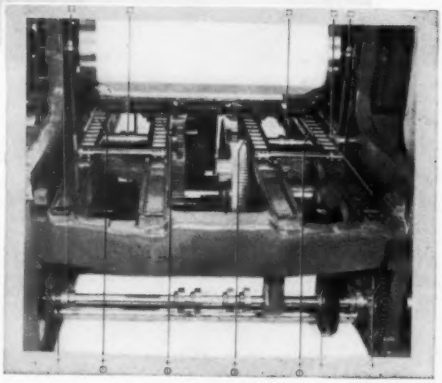


into two or more parts so that more than one grade of oil can be handled if desired. Under such conditions care must be observed in filling to make sure that the right oil is always put in the proper compartment.

The pump itself functions through an eccentric or cam located usually within the reservoir being driven by the exterior operating mechanism such as the ratchet. Each pumping unit can be arranged so as to operate independently, and capable of individual regulation. In order that the extent of lubrication or rate of pumping can be observed, oil is delivered from the pump unit through a suitable gauge glass or sight feed device. The purpose of locating this latter in the discharge line is, of course, to enable observation of oil flow as the lubricator is functioning.

Oil Mist Lubrication

Oil mist lubrication is well suited for high speed precision mechanisms. Since it requires air under



Courtesy of Miller Printing Machinery Company

a certain amount of pressure, it is best adapted to stationary units. During operation a uniform mist of oil (which is developed by injecting oil drop-by-drop into a stream of low-pressure air) continually fills the entire bearing space and by reason of it contacting all parts of the bearing, it develops a very dependable means of lubrication.

Oil mist lubrication is not measured lubrication

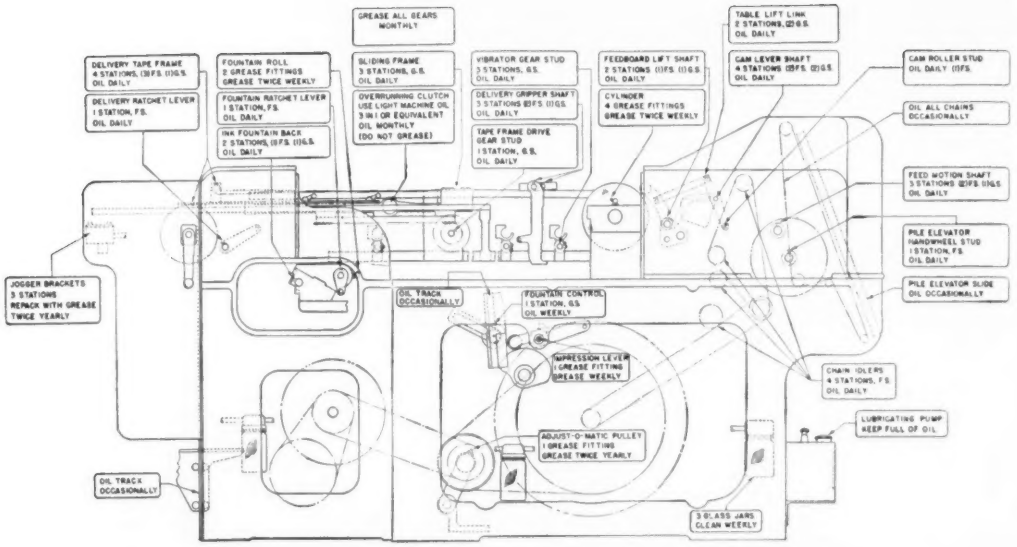
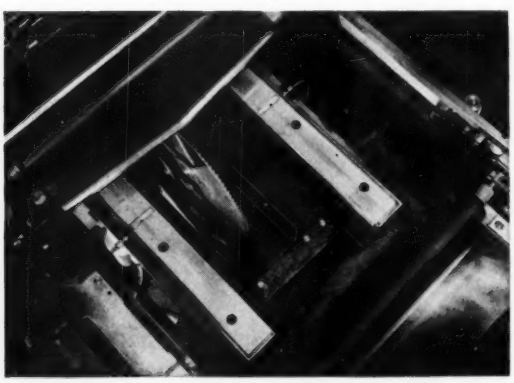


Figure 5 — Lubrication chart for the ATF little gian model 6 press; with view showing automatic lubrication of the bed tracks and drive gear.



Courtesy of American Type Founders, Inc.

in the true sense of the word although the procedures perfected provide for very accurate control in terms of oil delivered. A regulator located ahead of the lubricator accurately controls the air pressure being admitted to the latter. A high quality filter usually is inserted in the line ahead of the lubricator to provide clean dry air.

Wick Feed Oiling Systems

In contrast to the several methods of lubrication, which provide for protective oiling from a central point of control, the wick feed oiler as applied to the printing press, involves unit lubrication. In other words, one or more such oilers must be used to serve each bearing, although they can all be gathered together at one point of location on the side of the press, each being connected by suitable tubing to the bearing to be lubricated.

Wick feed oilers are adjustable in their rate of oil flow according to the number of strands contained in the wick. These can be readily varied according to the bearing requirements, the size and speed of rotation.

Oil feed is automatic, in that the wick will continue to feed oil just as long as there is any contained in the oil cup. On the other hand, where the press is to be shut down intermittently, this may develop into waste, for some oil will be fed whether the machine is running or not.

This, however, is overcome by installing a suitable shut-off cock in the oil line. Then it is only a matter of opening each cock when the machine is to be started, or shutting same when closing down. The only other attention required is refilling with oil.

Circulating Systems

In larger high speed types of press construction the trend is toward the use of enclosed housings with circulating oiling systems. In a system of this kind the oil is contained in the main reservoir being pumped by means of a rotary pump to all parts to be lubricated within the enclosed housings. Oil return is by gravity via suitable pipings to the main supply tank. A filter is located in the supply line to insure that only clean oil reaches the parts to be lubricated.

While this type of oil circulating system with enclosed housings may add to the cost of press construction, it is extremely economical in operation as it reduces oil consumption and wear on

press parts to a minimum. This reacts favorably towards reduced maintenance costs.

Pressure Grease Lubrication

The pressure grease gun also is widely used for press bearing lubrication either as a unit or via a centralized point of application. The compression grease cup and spring type lubricator also are unit lubrication devices which are useful for applying grease directly to accessible bearings, or via tubing to interior locations.

In the typical spring type lubricator a pressure grease gun is required to fill the containing cup via a suitable fitting. Subsequently the rate of discharge is controlled by the spring tension acting upon a follower plate which forces the grease through the discharge orifice. Flow of grease can be noted by observing the relative height of the indicator.

Filling such a cup is a simple and cleanly procedure; it merely amounts to attaching the pressure gun to the fitting located in the base. The cover does not have to be removed as may be true with those cups which are more strictly of the hand pressure type. Consequently there is more positive assurance that the grease charge will not become contaminated through possible entry of dust or dirt. The next step is to charge the cup with grease until the indicator rises to its full height to show that the former is quite full.

Pressure grease guns are operated by compressed air, electric power, or simply hand or foot power, according to the type of gun and the pressure desired. Where a relatively simple hand pressure grease gun is used, the impression may be gained that this should be classified with the hand pressure or screw-down type of cup. Hand pressure however applied to a grease gun does not react directly on the bearing; it is only the means used for forcing out the grease. With the spring type cup lubrication is automatically maintained by the mechanical action of the spring upon the adjacent plunger which bears upon the grease charge to force it through the bearing.

FLAT BED PRESS REQUIREMENTS

Bearings, cams, chain links, air spring, seals and gears including the "star wheel" constitute the operating parts on the flat bed press. Lubrication of these parts must be attended to regularly if best

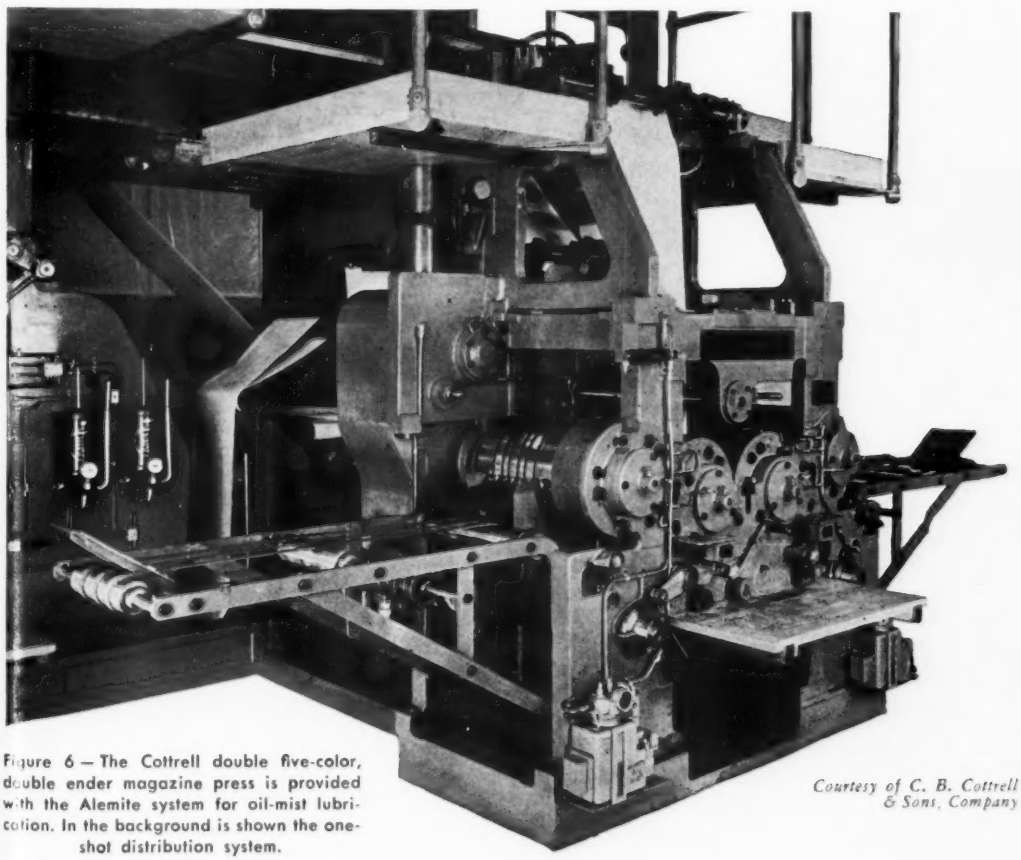
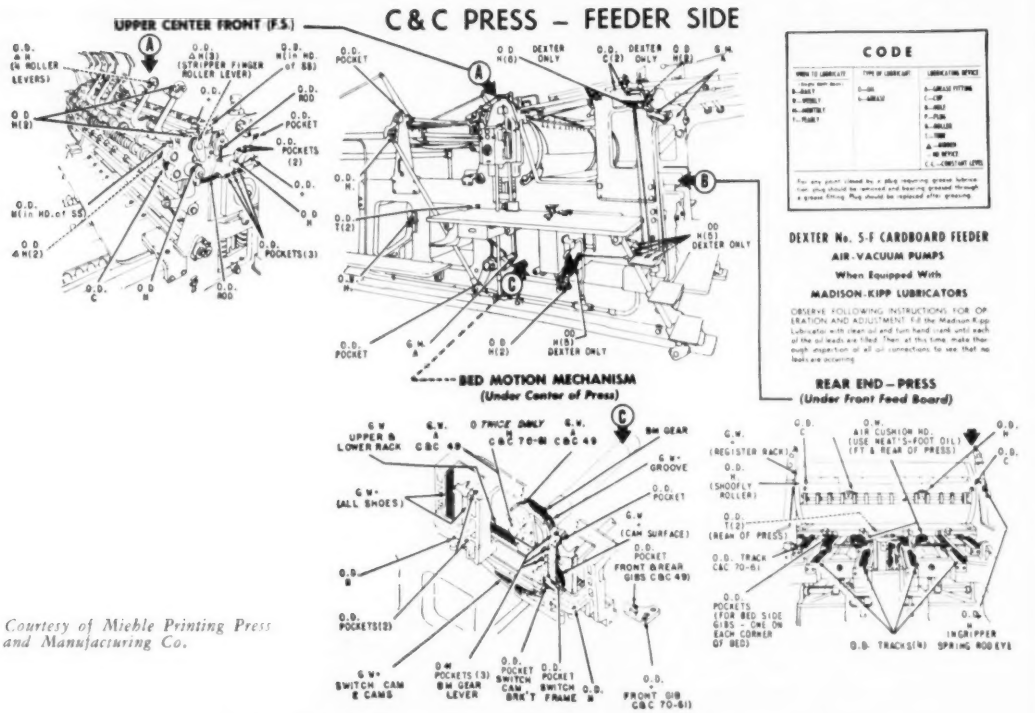


Figure 6 — The Cottrell double five-color, double ender magazine press is provided with the Alemite system for oil-mist lubrication. In the background is shown the one-shot distribution system.

Courtesy of C. B. Cottrell & Sons, Company



Courtesy of Miehle Printing Press and Manufacturing Co.

Figure 7 – Typical lubrication chart as prepared by Miehle for certain of the mechanisms of the C&C Press-Feeder side. Note use of Madison-Kipp lubricators and code for lubricant application.

results are to be obtained. When hand lubricated machines are involved this is especially important. There is usually no lubricant reservoir of any extensive capacity installed in connection with such a press. Consequently, the human element is practically the deciding factor, and the care and regularity with which the press mechanisms are lubricated will be directly related to the operating efficiency, rate of production attained and power consumption.

The function of each part requiring lubrication must be borne in mind in this regard. It is not enough to simply squirt oil casually into every oil hole in sight or to sluice the gears or bearings. This will only waste oil and cause both the machine and floor to become an oily mess to endanger the safety of the operators. It is far better to recognize that every pair of surfaces in contact with each other possess a certain relation in their motion with respect to each other and therefore require a certain definite amount of lubrication at the points of contact in order to reduce solid friction as much as possible. Practice and observation will enable the pressman to determine how much and how often to plan for re-lubrication.

Press Design Is a Factor

The design and age of the press naturally enters into the picture. A new press will require somewhat more oil and greater frequency in its application than one which has been in operation long enough to work all its mechanisms into a "running fit."

Ink rollers also must be studied. Difficulty may sometimes be encountered in press operation by bursting of such rollers at the ends, especially when running short forms. Here considerable friction may develop between the ends of the rollers and the dry surface of the ink plate. In such cases, it is advisable to coat the plate beyond the inking line with a light or medium bodied grease in order to insure against development of abnormal friction. Strict observance of this rule will assure maximum production with minimum power consumption and the life of rollers can be materially lengthened.

Press Bearings

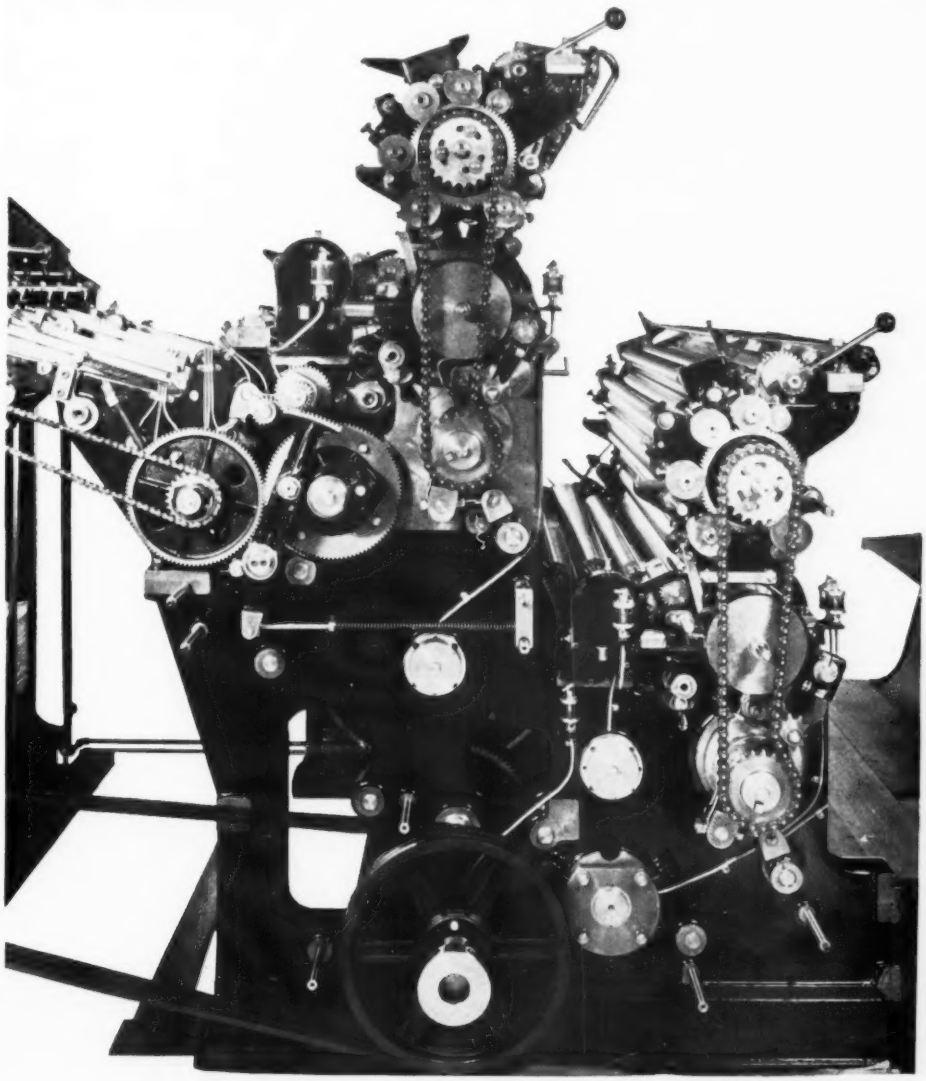
Where bearings are externally heated as for example at the ends of ink rollers, etc., they are often fitted with reservoirs in the top bearing cap or to one side of the base. These reservoirs customarily are packed with waste and designed for oil saturation at regular intervals. All bearings are not so accessible, however, for some are located beneath the press. Lubricant distributing piping

can be run from the holes in the bearing caps to the side of the press to provide for either oil or grease lubrication according to the type of bearing and means of lubrication.

On some flat bed presses, special attention must be given to parts such as bed motion shaft boxes, flywheel shaft boxes, cylinder and eccentric boxes. In fact, any bearing part located adjacent to the side frame or set in a close fit between the side frame jaws as are all types of cylinder boxes, require regular and careful lubrication. Any impairment of lubrication at these points may cause roughening of the contact surfaces, with the possibility of the cylinder being unable to take its full lift. This would affect the register or proper correspondence of the lines, etc., on opposite sides of the printed sheets.

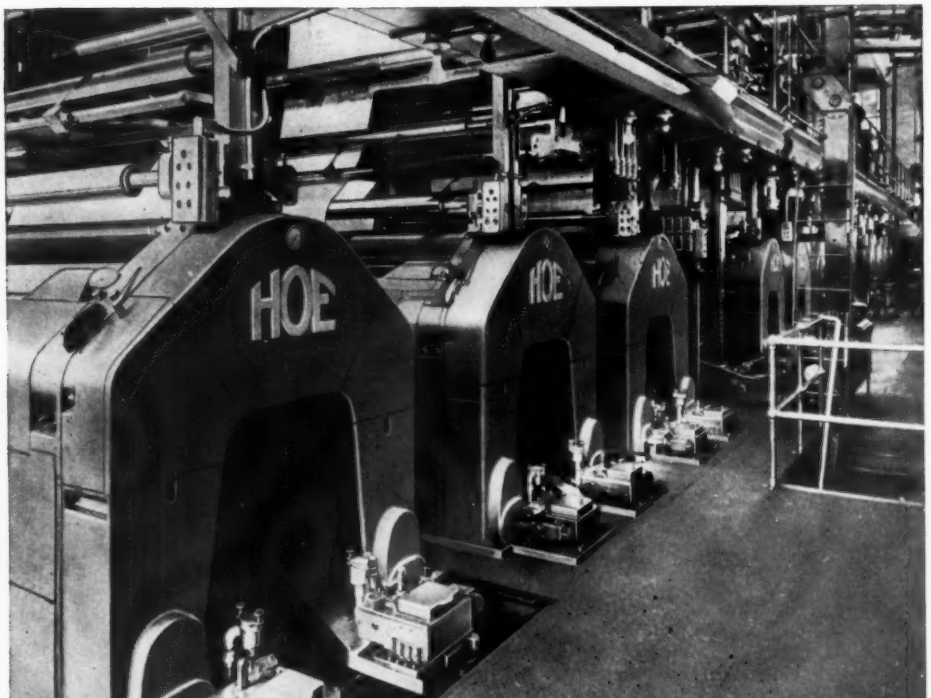
Bearing Lubricants

Flat bed press bearings are lubricated by straight mineral oils of medium viscosity (viz: from 300 to 500 seconds Saybolt at 100 degrees Fahr.), or medium consistency greases (N. L. G. I. No. 2 grade) according to the means provided for application. Oils of this viscosity range can be handled by oil mist, a centralized system or a sight feed or mechanical force feed oiler. The choice of grease, however, should be made with consideration of



Courtesy of Harris-Seybold Company

Figure 8 — Over-all view of the gear side of a Harris-Seybold press showing details of mechanism, oil cups and oil lines.



Courtesy of R. Hoe & Co., Inc.

Figure 9 — Typical view of a line of Hoe newspaper presses. Force feed lubrication and oil circulation are features on this type of press.

the type of bearing and the means of lubrication. Do not use products which show any tendency to gum for ultimately the bearing grooves or races will become clogged to interfere with distribution of the lubricant.

Flat Bed Press Gears

Gear tooth wear can be prevented by keeping the teeth well coated at all times with a special gear lubricant adapted to the type of housing. Adequate body and some extreme pressure quality will not only enable the film on the teeth to resist squeezing out but will also furnish a sufficient cushion to prevent metal-to-metal contact under high load operating conditions. According to the type of housing such a lubricant should not thin out too much if operating temperatures rise, otherwise the film of lubricant might be thrown off.

While it is true that some pressrooms may use their bearing oil for the press gears it must be remembered that such oils may not always be satisfactory especially if heavier gear lubricants have been customarily used. Mixture of the two may present more or less of a problem for the gear lubricant film may be so thinned down by the lighter oil as to destroy its adhesiveness and protective ability.

For this reason some pressmen may prefer a relatively heavy grease with sufficient soap content to insure against too great a reduction in the body of the lubricating film. When the press oil is used on the gears the latter should be oiled with the same care and regularity as the bearings. On lighter gears lubricating in this manner with oil is quite satisfactory but the heavier roll gears will usually function with less noise, less wear and greater efficiency if a more typical viscous gear lubricant is used.

The main driving gear or "star wheel" is probably the most vital operating part on a flat bed press from the viewpoint of lubrication. This gear carries the entire load of the machine and is subjected to heavy duty, considerable wear and oftentimes lack of attention due to its more or less inaccessible location beneath the type bed. The "star wheel" is subject to especially severe service when the air cushions are not functioning properly or where the pressure is not absolutely equalized. Under such conditions the shock which may develop everytime the press bed starts and stops will naturally impose a severe and uneven load upon

the teeth to result in wear or even tooth breakage in case lubrication is not properly maintained.

Cams and Chain Links

Bearing lubricants are equally as effective on cam surfaces and chain links as on press bearings. After careful application the main concern is to guard against throwing of the lubricant as much as possible. On the other hand where presses are not expressly designed for protected lubrication a certain amount of lubricant throw or drip may be beneficial in lubricating other parts although it can result in a messy condition and possibly a hazard.

Lubricating the Air Springs

Air springs on a flat bed press are used to conserve energy. In effect, they serve as shock absorbers. An effective seal enables the action of the press to gain the benefits of full compression. The condition and method of packing of the leather is the controlling factor. It must be properly centered on the piston so as to enter the cylinder without undue friction. These objectives are more nearly assured if the packing is kept soft and pliable by lubrication. Periodic soaking or boiling in neatsfoot oil is the usual procedure.

The walls of the cylinder, however, are best lubricated by a medium bodied, average melting point grease. A suitable film of such a lubricant will not only reduce rubbing friction to a marked extent, but also will insure against leakage of air.

Starting Up Procedure

When starting up a flat bed press it is advisable always to turn it over by hand a few times before throwing on the power to be sure that the proper "feel" at the wheel is present.

A competent press operator can develop a sense of judgment in regard to this "feel" which is of inestimable value in checking up on lubrication. In fact quite as essential as a knowledge of all parts requiring lubrication is the ability to judge whether these parts are functioning with a minimum of friction.

Cleaning to Remove Foreign Matter

When the press is used intermittently, it is well to rinse out bearings, oil holes and waste pad reservoirs with kerosine at frequent intervals, especially if dirt or dust is prevalent in the pressroom or when certain grades of paper are used which develop "fluff". All this must be removed otherwise obstructions will accumulate to interfere with delivery of the oil to the contact parts.

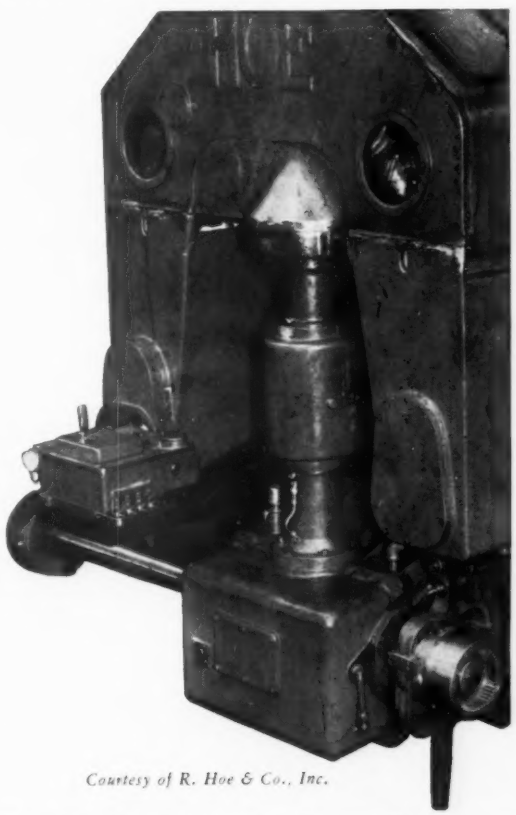
THE NEWSPRESS

The modern newspress is a rotary cylinder machine wherein the plates of typographical matter are curved to the periphery of the type cylinders and retained thereupon in proper relation to each other by means of a suitable locking device which is set when the press is made ready. Paper is fed to it in a continuous sheet or web from a roll.

To appreciate the importance of lubrication on a newspress the details of operation must be understood.

The presses are in general composed of several or more units or sections with suitable folding mechanisms. Each unit has two (2) plate and two (2) impression cylinders plus suitable inking mechanisms; the purpose of the former being to carry the curved stereotype plates from which the actual printing is done and of the latter to press the web of paper up against these plates. Each plate cylinder carries eight (8) stereotype plates each the size of a full page of the newspaper and as there are two (2) plate cylinders to each printing unit there would be a total of 16 pages of newsprint to come from each unit. This number is multiplied by the number of units embodied in each press line.

In general construction the news or web press comprises an assembly of bearings, gearing, and



Courtesy of R. Hoe & Co., Inc.

Figure 10 — Drive side of a Hoe color-convertible newspress unit with oil tight gear housing and oil reservoir shown.

cam devices the same as the flat bed press, but no reciprocating motion is involved. Therefore, air cushions, bed rollers and tracks are eliminated. The magazine electrotype web press embodies practically the same principles of operation as the newspaper press.

Lubrication Is Related to Production

The importance of proper lubrication is fully realized by most press builders today. As evidence they equip all important bearings of their machines with self-oiling or anti-friction bearings, and guard all gears as completely as possible not only for the safety of the operators but also to keep the gear lubricant where it belongs.

The web press involves an intricate assembly of bearings, gears and cams; all are so definitely dependent upon the others that any interference with operation would affect the production of the machine as a whole. In other words, a stripped gear, a burned out bearing, or a worn cam anywhere on the press might easily cause partial or complete shutdown, for such parts usually cannot be renewed or repaired during operation.

To enable most dependable operation a definite trend has been directed toward the use of ball and roller bearings in press construction. It is customary to mount the printing cylinders as well as the folding and cutting cylinders on roller bearings. All other rotating parts such as pipe and compensating rollers or the rollers over which the web passes in going through the folders are carried on ball bearings. Here it is essential on such equipment to eliminate the possibility of smudging.

Lubrication of the average ball or roller bearing will depend upon the nature of its housing. Where this latter is oil tight, the bearing can be adequately served by a light bodied straight mineral oil. Usually a viscosity in the neighborhood of 300 to 500 seconds Saybolt is advisable.

Where the bearing is designed for grease a medium consistency grease (N. L. G. I. No. 2 grade) is generally satisfactory. Grease can be more readily retained than oil especially if the seals are not entirely tight, but the grease selected must be especially prepared for anti-friction bearings. The required characteristics are low torque to insure minimum drag, and resistance to oxidation to prevent gum formations.

Main Bearing Requirements

The bearings which carry the main, intermediate and folder driving shafts, generally are of extra heavy design and equipped with either ball bearing or self-oiling pillow blocks below the bed plates.

With self-oiling bearings there is little or no chance for wasted oil, and with the reservoir once filled, effective lubrication should be assured for extended periods. For such service a well refined straight mineral lubricating oil having a viscosity of from 300 to 500 seconds Saybolt at 100 degrees Fahr., will generally meet the operating requirements.

On presses of older construction, plain and open bearings are in use on practically all pipe rollers and other shafting. They require more frequent lubrication, the press oil as suggested for self-oiling bearings usually being satisfactory.

Newspress Gears

The tendency of fluid oils to drip from plain or open bearings can impair effective gear lubrication on the newspress, just as on the flat bed press, due to the possibility of such oils washing off the heavier gear lubricants which may have been used. Guarding the gears is advantageous to a certain extent but guards will not always protect the gear teeth completely.

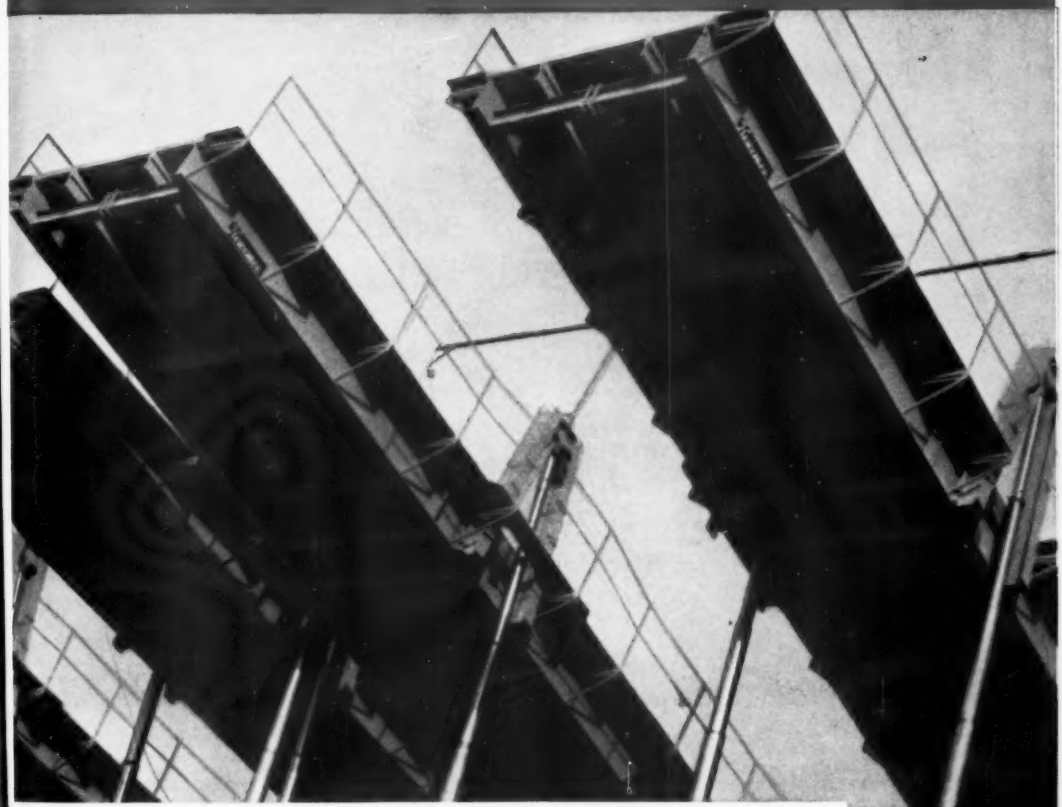
Press gear lubrication therefore presents a condition wherein the grade of lubricant should be selected in line with the mechanical construction of the press bearings and the installation of adequate gear guards. Wherever possible, a specially prepared heavy bodied gear lubricant will prove most adaptable by reason of its economy, its adhesive characteristics and its ability to resist squeezing out from between the teeth under abnormal pressures. Obviously this type of lubricant must be carefully applied and the frequency of re-lubrication studied to promote economy of lubricant along with protection of the gear teeth.

CONCLUSION

A discussion of lubrication in the modern pressroom would not be complete without mention of the relation of mechanized lubrication to preventive maintenance and the production schedule. Printing is a profitable business as long as the machinery is operating. Take a press out of service for repair and the initial investment is not paying off. This term preventive maintenance can be associated with machinery insurance. In fact it becomes just that when the machines are kept properly lubricated and adjusted to assure of most perfect synchronism between the operating mechanisms. The cost of effective lubrication is a minor detail when compared with the initial cost of the machine and its daily production value. Effective lubrication by controlled application has another decided benefit — it is excellent insurance that pressroom operators will be protected against accident from slipping on dripped lubricants. When any system of automatic lubrication is properly controlled, leakage is virtually nil.

Printed in U. S. A. by
Salley & Collins Inc.
305 East 45th Street
New York 17, N. Y.

CLEAN, RUST-FREE RAMS



TRUCKS loaded with cotton seed run onto these hydraulic dumps are emptied fast and efficiently. Note how bright and clean the dump rams are — visible evidence of the inner cleanliness of a system where *Texaco Regal Oil R&O* is the hydraulic medium.

Tests show that *Texaco Regal Oil R&O has more than ten times the oxidation resistance* of ordinary turbine-quality hydraulic oil — plus far greater ability to prevent rust and foam. That's why you'll find no sludge, no rust, no foam in systems charged with *Texaco Regal Oil R&O*.

There is a complete line of *Texaco Regal Oils R&O* — designed to provide clean, dependable, low cost performance from every type and size of hydraulic mechanism.

A Texaco Lubrication Engineer will gladly help you select the proper one. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils R&O

FOR ALL HYDRAULIC UNITS

COPPER MINING, for example. Here's an industry where machinery and equipment, above and below ground, really "take a beating."

Only *effective lubrication* can keep it running and keep the cost of maintenance low. So—

For over 20 years, more copper ore in the U.S. has been mined with Texaco-lubricated equipment than with any other.

Put made-for-the-job Texaco Lubricants and skilled Texaco Lubrication Engineering Service to work in *your* business. The benefits in greater efficiency and lower unit costs will be worth while.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

THE TEXAS COMPANY • TEXACO PRODUCTS • DIVISION OFFICES

ATLANTA 1, GA., 864 W. Peachtree St., N.W.
BOSTON 17, MASS......20 Providence Street
BUFFALO 3, N. Y......14 Lafayette Square
BUTTE, MONT......220 North Alaska Street
CHICAGO 4, ILL......332 So. Michigan Avenue
DALLAS 2, TEX......311 South Akard Street
DENVER 5, COLO......1570 Grant Street
HOUSTON 1, TEX......720 San Jacinto Street
INDIANAPOLIS 1, IND., 3521 E. Michigan Street
LOS ANGELES 15, CAL.....929 South Broadway
MINNEAPOLIS 3, MINN.....1730 Clifton Place
NEW ORLEANS 12, LA......1501 Canal Street
NEW YORK 17, N. Y......205 East 42nd Street
NORFOLK 1, Va.....Olney Rd. & Granby Street
SEATTLE 11, WASH......1511 Third Avenue

Texaco Petroleum Products are manufactured and distributed in Canada by McColl-Frontenac Oil Company Limited.